Comprehensive Long-Term Environmental Action Navy (CLEAN)

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Western Division
Naval Facilities Engineering Command
San Bruno, California 94066-2402

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CLEAN

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CONCORD NAVAL WEAPONS STATION
CONCORD, CALIFORNIA

MONITORING PROGRAM IMPLEMENTATION

MONITORING CONTINGENCY PLAN
DRAFT FINAL

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1.0 INTRODUCTION

PRC Environmental Management, Inc., (PRC) received Contract Task Order (CTO) No. 0009 from the Department of the Navy's (Navy) Western Division, Naval Facilities Engineering Command (WESTDIV), under Contract No. N62474-88-D-5086. This CTO calls for PRC to implement the Monitoring Plan (Lee, et al 1989) during the remediation and restoration of portions of the Tidal Area at the Naval Weapons Station, Concord, California (NWS Concord).

As part of implementing the Monitoring Plan, CTO No. 0009 requires development of a Monitoring Contingency Plan. The Monitoring Contingency Plan presented in this document provides for deviations from the Monitoring Plan to address specific contingency situations that may arise during and after completion of the remedial activities, such as analyzing additional parameters in response to increases in soil metals content.

The following sections describe the background of the site; summarize the Monitoring Plan; and specify the sequence of actions and tasks to be implemented under contingency situations.

2.0 BACKGROUND

NWS Concord is the Navy's principal ammunition trans-shipment port on the west coast. It is located in the north-central portion of Contra Costa County, approximately 30 miles northeast of San Francisco, California (Figure 1). NWS Concord is bound on the north by Suisun Bay and on the south and west by the City of Concord, with a population of approximately 100,000. NWS Concord encompasses over 12,904 acres of land consisting of three holdings: the Tidal Area, the Inland Area (linked to the Tidal Area by a narrow Navy-owned rail and road corridor), and a radiography facility located at Pittsburgh, California (Cullinane, et al 1988).

The Navy purchased several land parcels (the Tidal Area) in the late 1960s and early 1970s that were subsequently found to be contaminated. In 1983, the Navy initiated a series of environmental investigations and studies at the Tidal Area. The results indicated that soils were contaminated with arsenic, cadmium, copper, lead, selenium, and zinc. Based on the types of identified contamination, the natural topographic and habitat differences, and the potential for a variety of applicable remedial measures, the areas of contamination were aggregated into four remedial action subsites (RASS) covering approximately 308 acres. Each RASS was further divided into three areas (active remediation, passive remediation, and monitoring). Figure 2 shows the locations of the four RASSs and two reference areas for the site. Data from the reference areas will be used as background for the site.

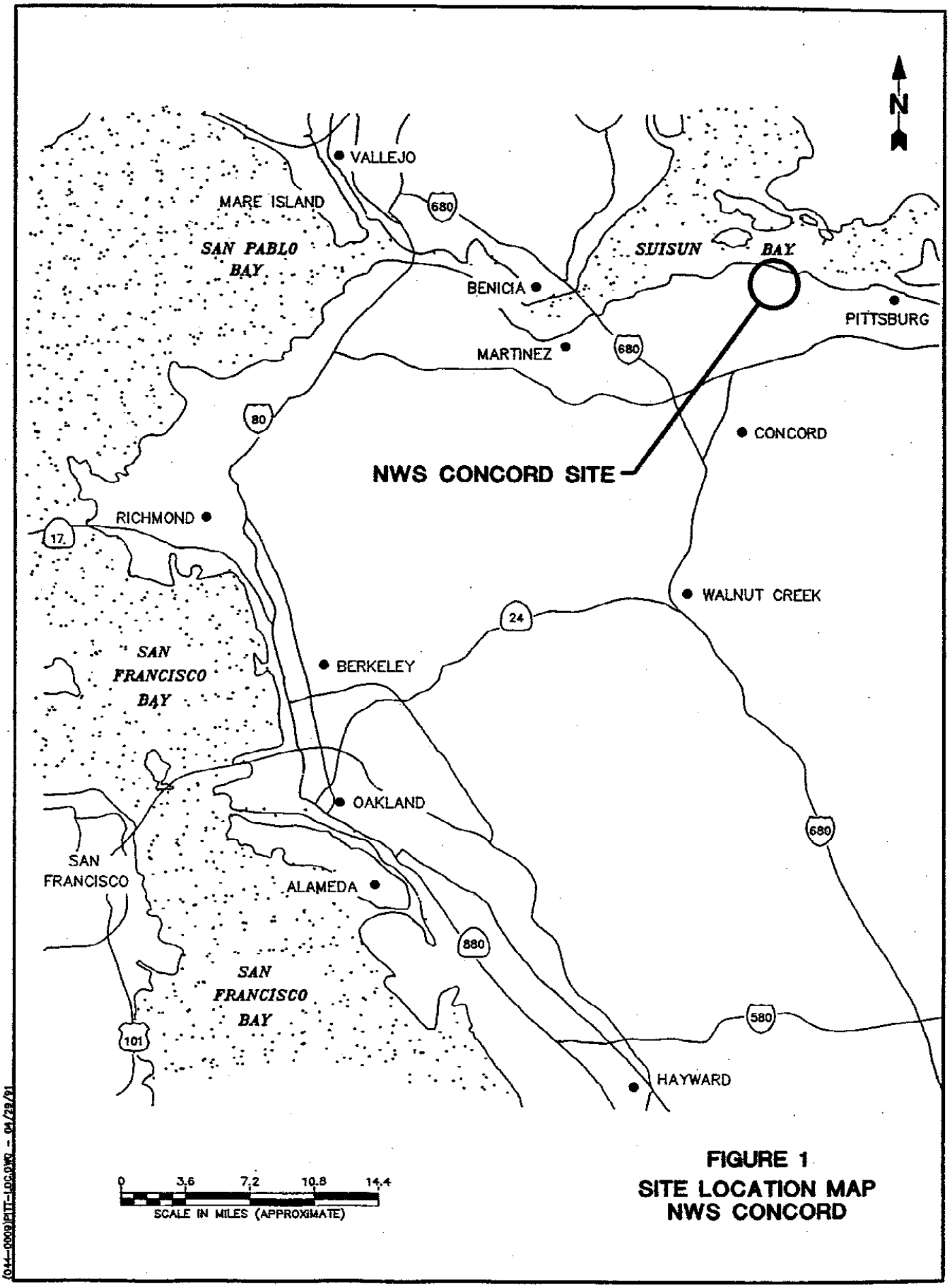

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FIGURE 1
SITE LOCATION MAP
NWS CONCORD

Figure 2

This detailed station map has been deleted from the Internet-accessible version of this document as per Department of the Navy Internet security regulations.

The cumulative results of the environmental investigations and studies led to the selection of a final remedial action plan formalized by the Navy in a Record of Decision dated April 6, 1989 (Navy, 1989). The final remedial action plan calls for excavation of contaminated soil over approximately 19 acres from the active remediation areas of the four RASSs.

3.0 MONITORING PLAN

The Monitoring Plan establishes guidelines for monitoring before, during, and after the remedial actions at NWS Concord. This plan is integral to implementing the remedial actions since it provides the means for evaluating the success of the remedial actions. If the monitoring results indicate the remedial actions are not successful, the contingency actions described in Section 4.0 of this document will be implemented.

The Monitoring Plan generally describes the monitoring activities for NWS Concord. The Site Monitoring Protocol document (PRC, 1990) was developed to specify how the Monitoring Plan will be implemented in the field.

The following sections briefly discuss monitoring objectives, parameters, and implementation as identified in the Monitoring Plan and the Site Monitoring Protocol.

3.1 MONITORING OBJECTIVES

Seven objectives have been established for the monitoring activities. Although RASSs share many of the same objectives, each objective may not apply to all RASSs and each RASS may have a unique objective. The seven monitoring objectives and the RASSs that each apply to are as follows:

Objective	RASS	Monitoring Objective
1	1, 2, 3, 4	Establish baseline conditions.
2	1, 2, 3	Assess the impact of active remediation on Suisun Bay.
3	1, 2, 3, 4	Determine if the area actively remediated becomes recontaminated; if so, determine the extent of recontamination.
4	1, 2, 3, 4	Determine if contaminants migrate from the area passively remediated; if so, determine the extent of contaminant mobility.

5	1, 2	Monitor wetland and transition zone restoration and revegetation.
5	3	Monitor wetland revegetation.
5	4	Monitor wetland and upland vegetation.
6	1, 2, 3, 4	Determine if ground water is impacted by the contamination.
7	1, 2, 3, 4	Determine if an uncharacterized area in the monitoring area is contaminated and, if so, the level of contamination.

Objectives 1 through 6 are identified in the Monitoring Plan and are integral to evaluating the success of the remedial actions. Objective 7 was subsequently added in response to regulatory agency comments. Since Objective 7 is not associated with evaluating the success of the remedial actions (and, therefore, is not associated with any contingency actions), it will not be considered further in this document.

3.2 MONITORING PARAMETERS

To evaluate the success of the remedial actions based on the monitoring objectives, the Monitoring Plan identifies several parameters for which sampling and analysis activities will be conducted in the RASSs and reference areas before, during, and after completion of the remedial actions. These monitoring parameters are listed in Table 1. Table 1 also lists the frequency at which sampling and analysis for these parameters will occur after remediation, as identified in the Monitoring Plan. Sampling locations and sampling and analysis procedures for each parameter are specified in the Site Monitoring Protocol (PRC, 1990).

The Monitoring Plan separates the parameters into two groups: "Phase 1" and "Phase 2." To establish baseline conditions (Objective 1), both the Phase 1 and Phase 2 parameters will be monitored. However, after baseline conditions are established, the Phase 2 parameters will be monitored only under specific contingency situations described in Section 4.0 of this document.

3.3 MONITORING IMPLEMENTATION

As noted previously, monitoring will be conducted before, during, and after the remedial actions. Monitoring before the remedial actions will be conducted to meet Objective 1, monitoring during the remedial actions will be conducted to meet Objective 2, and monitoring after the remedial actions will be conducted to meet Objectives 3 through 6.

TABLE 1

MONITORING PARAMETERS AND FREQUENCIES

Monitoring Parameters	Monitoring Frequency After Remediation
Phase 1	
Soil (metals, chemistry, and physical)	Annually for the first 5 years, then every 5 years for the next 25 years
Sediment (metals)[1]	Semi-annually for the first 5 years, then every 5 years for the next 25 years
Surface water (metals)[1]	Semi-annually for the first 5 years, then every 5 years for the next 25 years
Clam bioassay (metals)[1]	Semi-annually for the first 5 years, then every 5 years for the next 25 years
Ground water (metals)	Quarterly for 30 years
Vegetation, invertebrate, and wildlife characterization	Annually for the first 10 years, then every 5 years for the next 20 years
Site conditions	
Hydrologic surveys, topographical surveys, and meteorological conditions	Annually for the first 5 years, then every 5 years for the next 25 years
Site reconnaissances	Quarterly for 30 years
360^0 photography	Quarterly for the first 10 years, then annually for the next 20 years
Aerial photography	Semi-annually for the first 10 years, then annually for 20 years
Phase 2	
Vegetation, invertebrate, and wildlife bioaccumulation	When triggered by Phase 1 monitoring results

Note:

[1] Where appropriate conditions exist, such as in drainage ditches or other sites of continuous water flow.

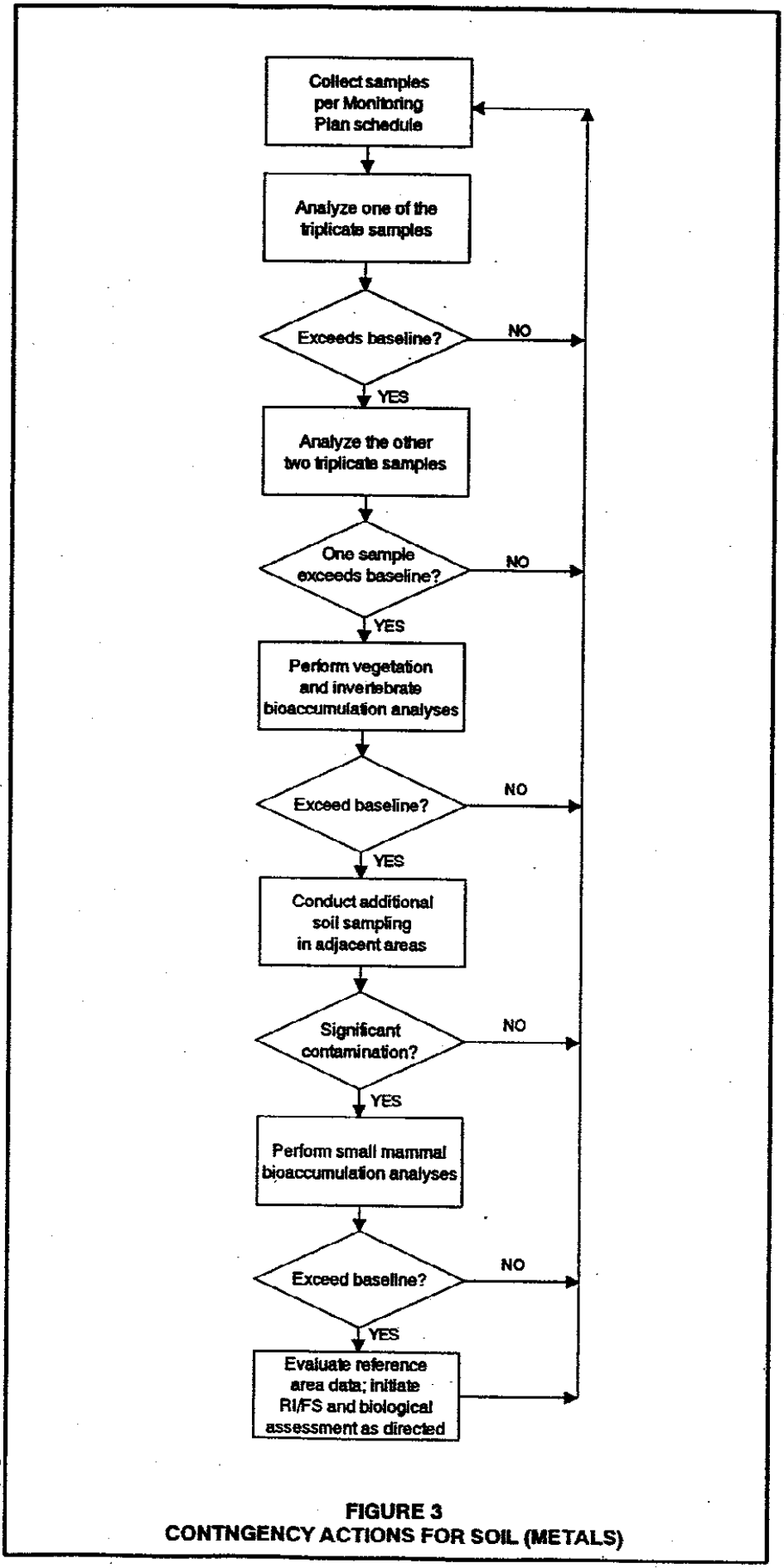

FIGURE 3
CONTNGENCY ACTIONS FOR SOIL (METALS)

first step in the contingency action, the other two triplicate samples collected at the same location will be analyzed to confirm the initial results. If neither sample exceeds the baseline value, the sampling schedule and procedures established in the Monitoring Plan will be continued.

If one of the two remaining triplicate samples exceeds the baseline value, vegetation and invertebrate bioaccumulation samples will be collected at the same location and analyzed. If both the vegetation and invertebrate samples do not exceed the baseline value, the sampling schedule and procedures established in the Monitoring Plan will be continued.

If either the vegetation or invertebrate samples exceed the baseline value, additional soil sampling will be conducted to determine the potentially contaminated areas. Specifically, to determine the lateral extent of contamination, soil samples will be collected from the corresponding quadrat in the grids directly north, south, east, and west of the soil sampling location that initially triggered the contingency monitoring process. If any of these locations is contaminated, soil samples will be collected from the adjacent grid; for example, if the location in the west grid is contaminated, the grid west of the west grid will be sampled. In this manner, the lateral extent of contamination will be established radially. In cases where adjacent grids have already been sampled as part of the monitoring program, these monitoring data will be evaluated in place of taking additional samples.

To determine the vertical extent of contamination, the 6- to 12-inch horizon will be sampled at the original sampling location. If this horizon is contaminated, deeper 6-inch horizons will be sampled until the soil metals content does not exceed the baseline value. Once the vertical extent of contamination is determined in the original sampling location, the four adjacent grids (north, south, east, and west) will also be sampled in 6-inch horizons until the soil metals content does not exceed the baseline value. Vertical sampling will continue in adjacent grids until the results indicate the 0- to 6-inch horizon is not contaminated. If lateral and vertical contamination is not significant (that is, contamination is confined to within the original grid), the sampling schedule and procedures established in the Monitoring Plan will be continued.

If there is significant lateral and vertical contamination (that is, contamination extends beyond the original grid), small mammal bioaccumulation analyses will be performed as appropriate and as directed by the Navy. If the small mammal sample results do not exceed their baseline value, the sampling schedule and procedures established in the Monitoring Plan will be continued.

If the small mammal sample results exceed their baseline value, data from the reference areas will be evaluated to determine if the condition is area-wide rather than RASS-specific.

Based on this evaluation, a remedial investigation/feasibility study (RI/FS) and a biological assessment will be performed as appropriate and as directed by the Navy. During this period, the sampling schedule and procedures established in the Monitoring Plan will be continued.

4.2 SOIL (CHEMICAL AND PHYSICAL)

Soil chemical analyses include pH, interstitial salinity, and conductivity; and soil physical analyses include soil texture. Since soil (physical) is a qualitative parameter, contingency actions are not appropriate, and, therefore, were not developed. The following paragraphs discuss contingency actions for soil (chemical) that are shown in Figure 4.

Triplicate samples will be taken at each location for analysis. A contingency action will be initiated if the first triplicate soil sample analyzed exceeds the baseline value. As the first step in the contingency action, the other two triplicate samples collected at the same location will be analyzed to confirm the initial results. If neither sample exceeds the baseline value, the sampling schedule and procedures established in the Monitoring Plan will be continued.

If one of the two remaining triplicate samples exceeds the baseline value, characterization data will be evaluated to determine if vegetation, invertebrate, or wildlife are unacceptably affected by the variance from the baseline value. The determination of "unacceptably affected" will be based on discussions with the Navy of factors such as species survival. If vegetation, invertebrate, and wildlife are not unacceptably affected, the sampling schedule and procedures established in the Monitoring Plan will be continued.

If vegetation, invertebrate, or wildlife are unacceptably affected, additional soil sampling will be conducted to determine the potentially contaminated areas. This additional sampling will be conducted as specified in Section 4.1 of this document. If the lateral and vertical extent of contamination is not significant (that is, contamination is confined to the original grid), measures to remedy the condition (such as liming areas with low pH) will be evaluated and implemented, and the sampling schedule and procedures established in the Monitoring Plan will be continued.

If the lateral and vertical extent of contamination is significant (that is, contamination extends beyond the original grid), measures to remedy the condition (such as liming areas with low pH) will be evaluated and implemented. In addition, data from the reference areas will be evaluated to determine if the condition is area-wide rather than RASS-specific. Based on this evaluation, an RI/FS and a biological assessment will be performed as appropriate and as directed by the Navy. During this period, the sampling schedule and procedures established in the Monitoring Plan will be continued.

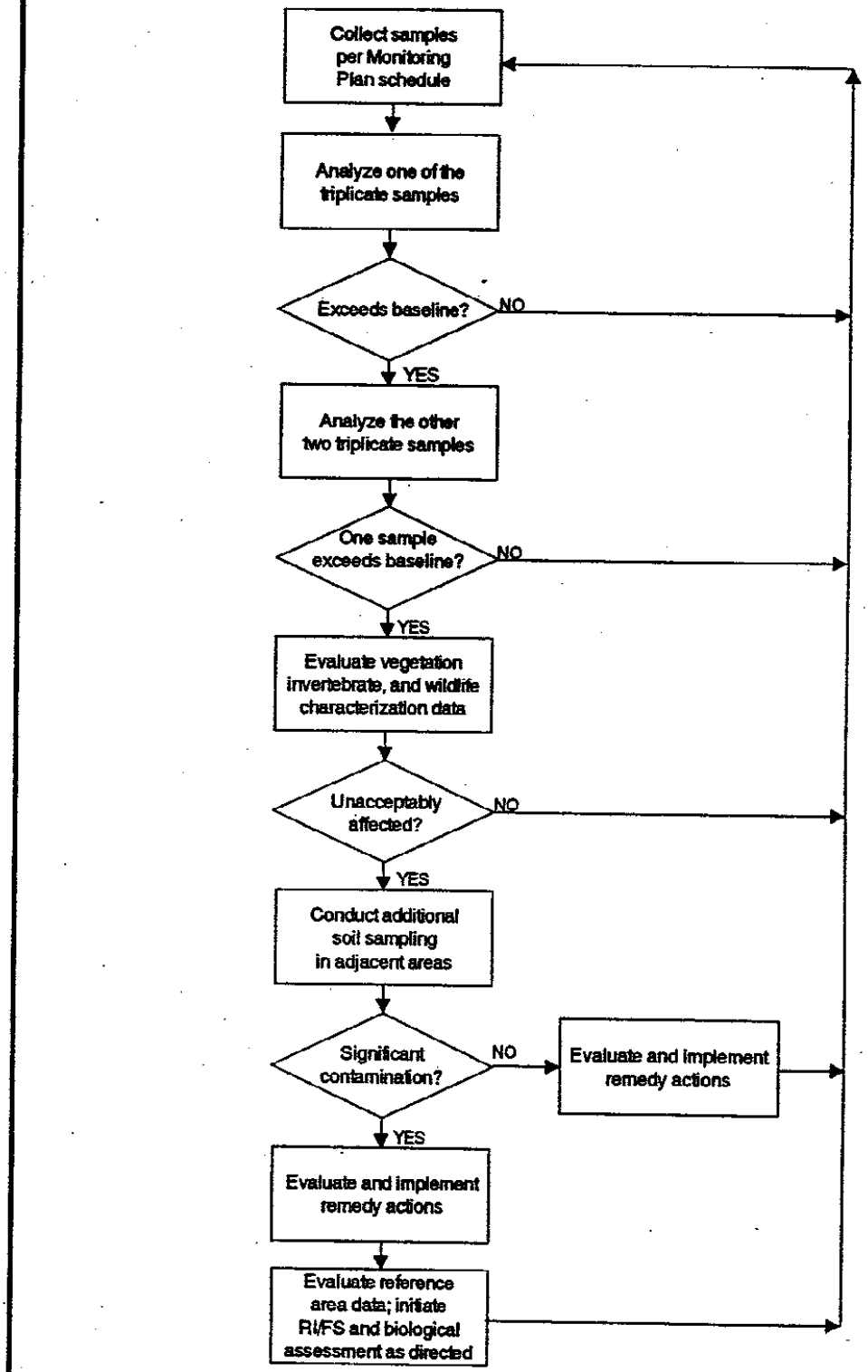

FIGURE 4
CONTINGENCY ACTIONS FOR SOIL (CHEMICAL)

4.3 SEDIMENT

Figure 5 shows the sequence of contingency actions to be taken for sediment. The sediment metals analyses include arsenic, cadmium, copper, lead, selenium, and zinc. Triplicate samples will be collected at each location for analysis. If the first triplicate sample analyzed exceeds the baseline value, the other two triplicate samples collected at that location will be analyzed to confirm the initial results. If neither sample exceeds the baseline value, the sampling schedule and procedures established in the Monitoring Plan will be continued.

If one of the two remaining triplicate samples exceeds the baseline value, additional sampling and analysis will be conducted to determine the potentially contaminated area. Specifically, sediment samples will be collected 100 feet upstream and downstream of the sampling location. If any of these locations is contaminated, soil samples will be collected from the next 100 feet; for example, if the location downstream is contaminated, another location 100 feet downstream will be sampled. In this manner, the lateral extent of contamination will be established. If contamination upstream and downstream is not significant (that is, contamination is confined to within 100 feet of the original location), the sampling schedule and procedures established in the Monitoring Plan will be continued.

If there is significant contamination either upstream or downstream (that is, contamination extends over beyond one hundred feet from the original location), measures to remedy the condition (such as excavating contaminated sediments) will be evaluated and implemented. In addition, data from the reference areas will be evaluated to determine if the condition is area-wide rather than RASS-specific. Based on this evaluation, an RI/FS and a biological assessment will be performed as appropriate and as directed by the Navy. During this period, the sampling schedule and procedures established in the Monitoring Plan will be continued.

4.4 SURFACE WATER

Figure 6 shows the sequence of contingency actions to be taken for surface water. The surface water metals analyses include total and dissolved arsenic, cadmium, copper, lead, selenium, and zinc. Triplicate samples will be collected at each location for both total and dissolved analyses. If the first triplicate sample analyzed exceeds the baseline value, the other two triplicate samples collected at that location will be analyzed to confirm the initial results. If neither sample exceeds the baseline value, the sampling schedule and procedures established in the Monitoring Plan will be continued.

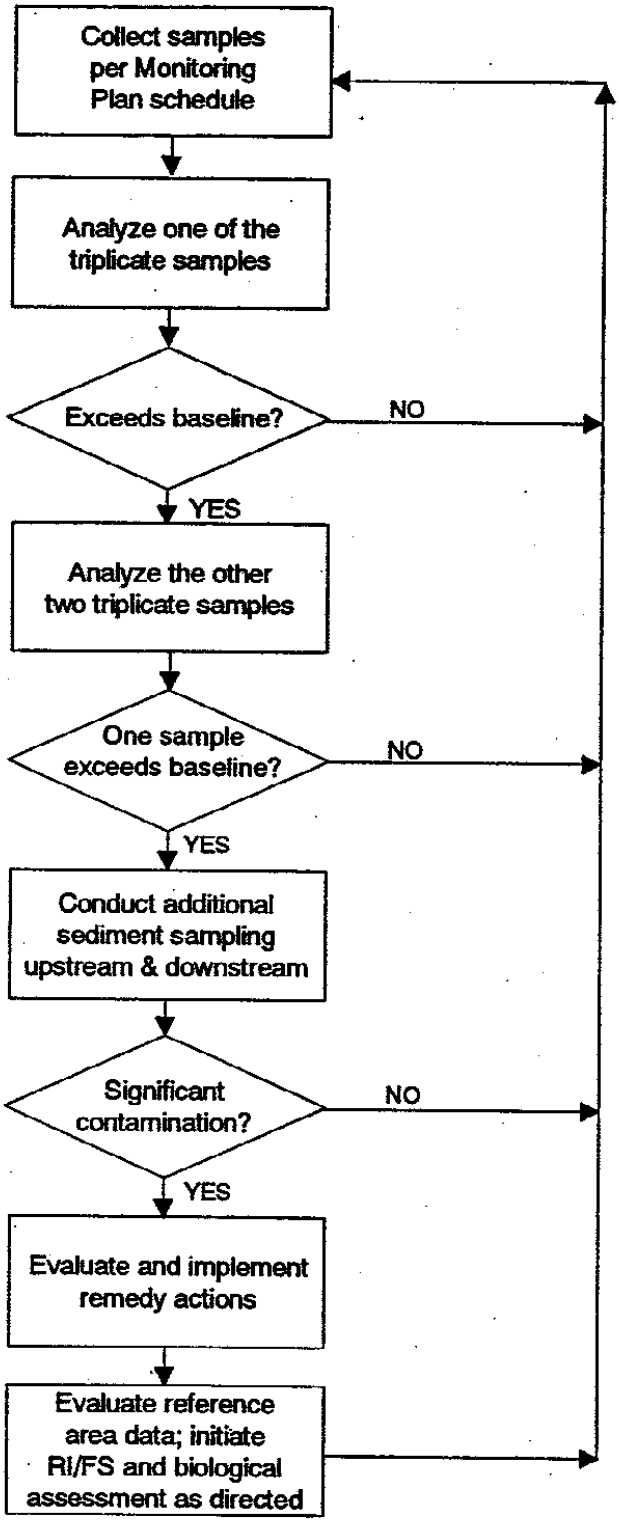

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FIGURE 5
CONTINGENCY ACTIONS FOR SEDIMENT

If one of the two remaining triplicate samples exceeds the baseline value, a surface water investigation will be initiated. The surface water investigation will consist of evaluating data from all surface water sampling locations to determine the extent, if any, of surface water contamination. As part of this investigation, surface water locations may be re-sampled to verify the initial results or additional surface water locations may be sampled to delineate the contaminated area. If the investigation indicates contamination is not significant (that is, contamination is not widespread), the sampling schedule and procedures established in the Monitoring Plan will be continued.

If the investigation indicates contamination is significant (that is, contamination is widespread), data from the reference areas will be evaluated to determine if the condition is area-wide rather than RASS-specific. Based on this evaluation, an RI/FS and a biological assessment will be performed as appropriate and as directed by the Navy. During this period, the sampling schedule and procedures established in the Monitoring Plan will be continued.

4.5 CLAM BIOASSAY

Figure 7 shows the sequence of contingency actions to be taken for clam bioassays. The clam bioassay metals analyses include arsenic, cadmium, copper, lead, selenium, and zinc. All triplicate samples collected at each location will be analyzed. If one or none of the samples exceed the baseline value, the sampling schedule and procedures established in the Monitoring Plan will be continued.

If two of these samples exceed the baseline value, additional clam bioassays may be conducted upstream or downstream, as directed by the Navy. If the results of this sampling indicate contamination is not significant (that is, contamination is not widespread), the sampling schedule and procedures established in the Monitoring Plan will be continued.

If the results of this sampling indicate contamination is significant (that is, contamination is widespread), data from the reference areas will be evaluated to determine if the condition is area-wide rather than RASS-specific. Based on this evaluation, an RI/FS and a biological assessment will be performed as appropriate and as directed by the Navy. During this period, the sampling schedule and procedures established in the Monitoring Plan will be continued.

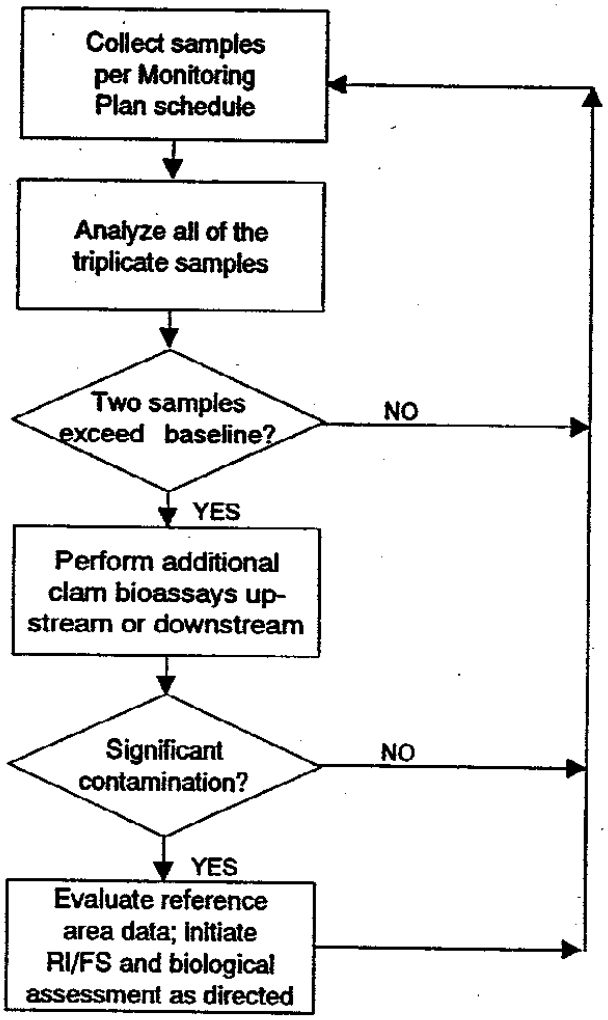

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FIGURE 7
CONTINGENCY ACTIONS FOR CLAM BIOASSAYS

4.6 GROUND WATER

Figure 8 shows the sequence of contingency actions to be taken for ground water. The ground water metals analyses include total and dissolved arsenic, cadmium, copper, lead, selenium, and zinc. Triplicate samples will be collected at each location for both total and dissolved analyses. If the first triplicate sample analyzed exceeds the baseline value, the other two triplicate samples collected at that location will be analyzed to confirm the initial results. If neither sample exceeds the baseline value, the sampling schedule and procedures established in the Monitoring Plan will be continued.

If one of the two remaining triplicate samples exceeds the baseline value, a ground-water investigation will be initiated. The ground-water investigation will consist of evaluating data from all wells in the RASSs to determine the extent, if any, of ground-water contamination. As part of this investigation, wells may be resampled to verify initial results. If contamination is not significant (that is, contamination is not widespread), measures to remedy the condition (such as excavating a "hot spot" of contaminated soil) will be evaluated and implemented, and the sampling schedule and procedures established in the Monitoring Plan will be continued.

If contamination is significant (that is, contamination is widespread), an RI/FS and a biological assessment will be performed as appropriate and as directed by the Navy. During this period, the sampling schedule and procedures established in the Monitoring Plan will be continued.

4.7 VEGETATION

Figure 9 shows the sequence of contingency actions to be taken for vegetation. Vegetation monitoring activities will be conducted to assess the establishment of the vegetation. Indicators to evaluate the establishment of vegetation include, but are not limited to, decreased colonization compared to that of the previous monitoring period, barren spots, or other undesirable conditions. These indicators will be evaluated to determine when contingency actions should be implemented. Specifically for grass and pickleweed, areas with barren spots more than 3 feet in diameter or where cover is considered to be "bare" or "sparse" will trigger contingency actions. Areas considered bare are those with less than 10 percent cover and areas considered sparse are those with less than 20 percent cover, as measured by the line-intercept method. Since these criteria are dependent on the time of year (season) and the time since planting, they should be evaluated accordingly. If vegetation establishment is acceptable, the sampling schedule and procedures established in the Monitoring Plan will be continued.

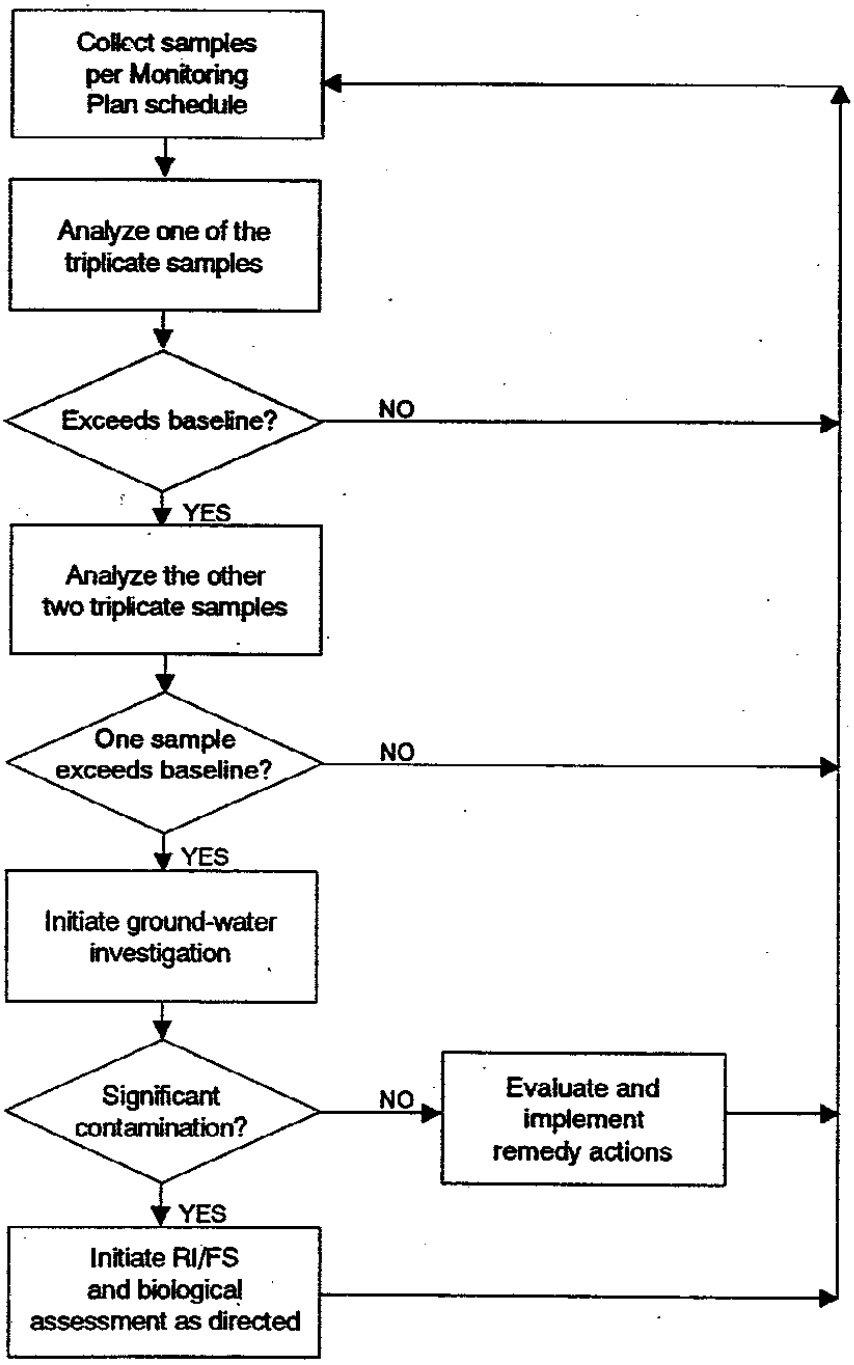

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FIGURE 8
CONTINGENCY ACTIONS FOR GROUND WATER

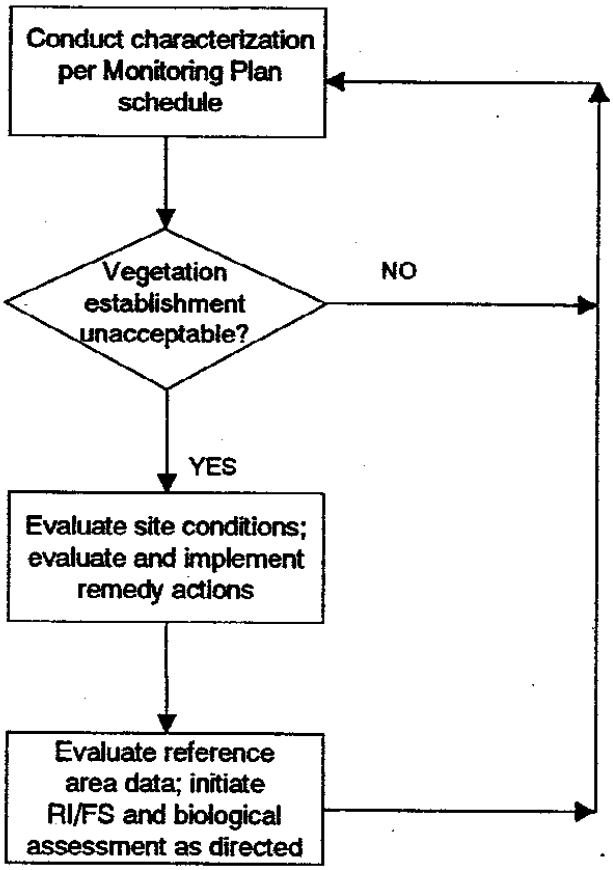

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FIGURE 9
CONTINGENCY ACTIONS FOR VEGETATION

If vegetation establishment is not acceptable, site conditions such as substrate elevation, hydrologic regime, and soil metals and chemistry will be evaluated. Based on the results of this evaluation, appropriate measures to remedy the condition (such as revegetation) will be determined.

In addition, data from the reference areas will be evaluated to determine if the condition is area-wide rather than RASS-specific. Based on this evaluation, an RI/FS and a biological assessment will be performed as appropriate and as directed by the Navy. During this period, the sampling schedule and procedures established in the Monitoring Plan will be continued.

4.8 INVERTEBRATES

Figure 10 shows the sequence of contingency actions to be taken for invertebrates. Invertebrate monitoring activities will be conducted to assess the stability of species populations. Indicators to evaluate the invertebrate population include, but are not limited to, decreased population compared to that of the previous monitoring periods. Since this and similar criteria may vary seasonally, they should be used to evaluate invertebrates accordingly. If the characterization activities indicate that the condition of the invertebrate population is acceptable, the sampling schedule and procedures established in the Monitoring Plan will be continued.

If the condition of the invertebrate population is not acceptable, site conditions such as substrate elevation, hydrologic regime, and soil metals and chemistry will be evaluated. Based on the results of this evaluation, appropriate measures to remedy the condition will be determined.

In addition, data from the reference areas will be evaluated to determine if the condition is area-wide rather than RASS-specific. Based on this evaluation, an RI/FS and a biological assessment will be performed as appropriate and as directed by the Navy. During this period, the sampling schedule and procedures established in the Monitoring Plan will be continued.

4.9 WILDLIFE

Figure 11 shows the sequence of contingency actions to be taken for wildlife. Wildlife monitoring activities will be conducted to assess the stability of species populations. Indicators to evaluate the wildlife population include, but are not limited to, decreased population compared to that of the previous monitoring period. Since this and similar criteria may vary seasonally, they should be used to evaluate wildlife accordingly. If the characterization activities indicate that the condition of the wildlife population is acceptable, the sampling schedule and procedures established in the Monitoring Plan will be continued.

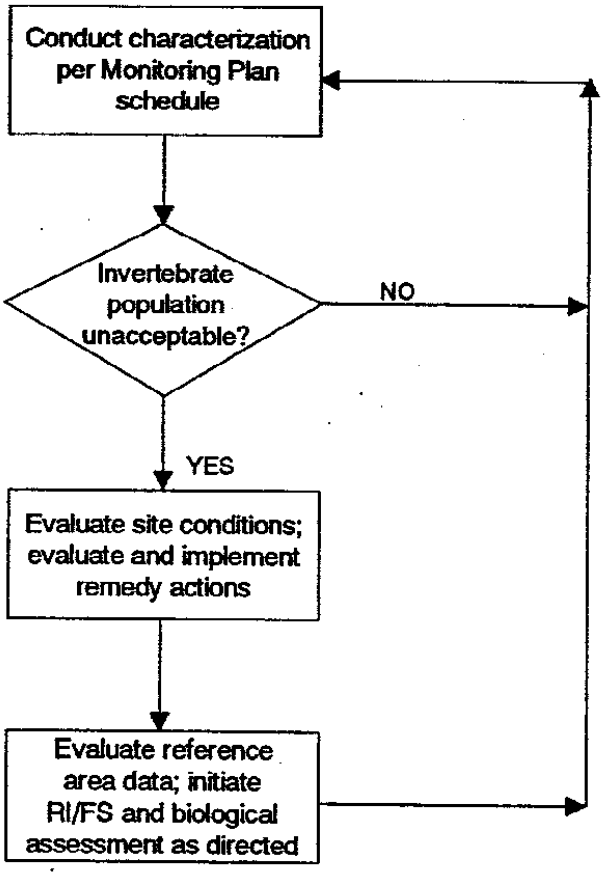

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FIGURE 10
CONTINGENCY ACTIONS FOR INVERTEBRATES

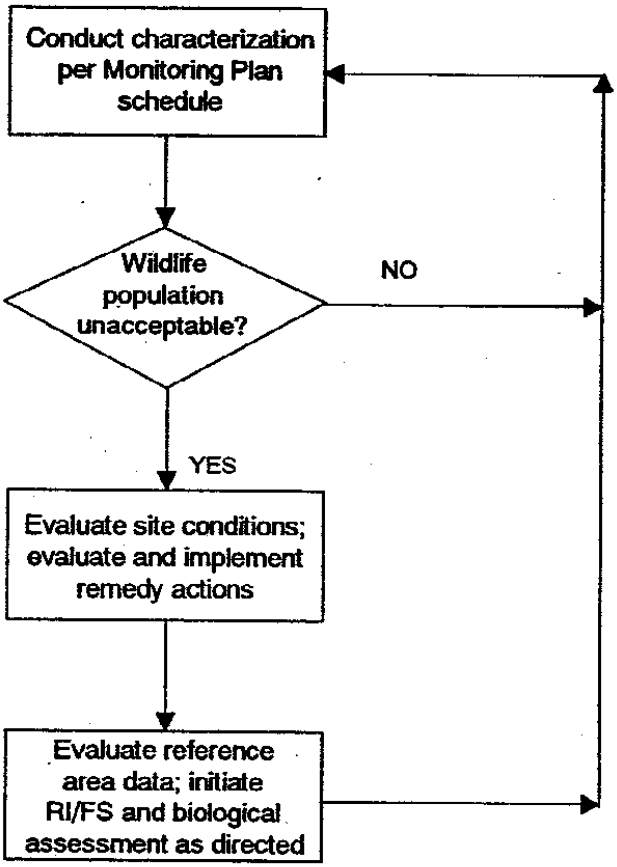

FIGURE 11
CONTINGENCY ACTIONS FOR WILDLIFE

If the condition of the wildlife population is not acceptable, site conditions such as available refugia, vegetation, and soil metals and chemistry will be evaluated. Based on the results of this evaluation, appropriate measures to remedy the condition (such as raising the height of the refugial mounds) will be determined.

In addition, data from the reference areas will be evaluated to determine if the condition is area-wide rather than RASS-specific. Based on this evaluation, an RI/FS and a biological assessment will be performed as appropriate and as directed by the Navy. During this period, the sampling schedule and procedures established in the Monitoring Plan will be continued.

4.10 SITE CONDITIONS

Site conditions will be evaluated by performing the following activities: hydrologic surveys, topographical surveys, monitoring of meteorological conditions, site reconnaissances, and photography (aerial and 360^0). The contingency actions for each of these activities are described in the following subsections.

4.10.1 Hydrologic Surveys

Hydrologic surveys include sediment measurements and surveying cross sections in ditches. Hydrologic survey results will be compared to the baseline value, and seasonal measurements, as appropriate. If unfavorable conditions prevail, such as sediment build-up in the ditches that unfavorably affects flow throughout the marsh area, the hydrologic regime will be evaluated and measures to remedy the situation will be taken as appropriate.

4.10.2 Topographical Surveys

It is anticipated that contingency actions will not be required for the results of the topographical surveys. Instead, the topographical surveys will provide supporting information for evaluating the other parameters.

4.10.3 Monitoring of Meteorological Conditions

Contingency actions will be initiated if severe weather events or changes impact site conditions. For example, after severe weather events such as record-high rainstorms and flood events, sampling and analyses will be performed in each RASS. These activities may include clam bioassays and soil, sediment, surface water, and ground-water sampling and analysis. The

objectives of the sampling and analyses will be to determine the extent, if any, of contaminant migration in each RASS as well as into other sensitive environments, such as Suisun Bay.

4.10.4 Site Reconnaissances

Contingency actions will be initiated if unacceptable site conditions are observed during site reconnaissances. Unacceptable conditions may include, but are not limited to, human-induced conditions (such as vegetation damaged as a result of off-road vehicles) or off-site emergencies (such as a chemical discharge from an adjacent property). Measures to remedy unacceptable condition (such as revegetating damaged areas) will be evaluated and implemented.

4.10.5 Photography (Aerial and 360°)

Contingency actions will be initiated if the aerial or 360° photography indicate there are unacceptable conditions at the site. Unacceptable conditions may include, but are not limited to, stressed vegetation in areas that are not being sampled under the monitoring program. Measures to remedy unacceptable condition (such as revegetating stressed areas) will be evaluated and implemented.

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